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Identity of the Type-specimens of *Sciurus aureogaster* F. Cuvier and *Sciurus nigrescens* Bennett (Mammalia, Sciuridae)

By GUY G. MUSSER¹

More than 60 scientific names and combinations of names have been applied to individual specimens and small samples of *Sciurus aureogaster* since the species was first described by Frederic Cuvier in 1829. This multiplicity of names reflects the wide morphological, ecological, and geographic diversity of *S. aureogaster*, as the limits of this species are presently understood (Musser, 1968). *Sciurus aureogaster* occurs in Mexico and Guatemala, is found in many different types of forests, and is among the most variable of tree squirrels of the Western Hemisphere in external and cranial dimensions and in color and pattern of pelage. During my systematic study of these squirrels, I examined either type-specimens or descriptions of most of the names which applied to them. At that time, however, I did not have an opportunity to visit London or Paris and could not provide any additional information about the type-specimen of *S. aureogaster* beyond that presented in an earlier taxonomic study of the species by E. W. Nelson in 1899. Nor could I resolve the identity of *S. nigrescens*, a taxon named and described by E. T. Bennett in 1833, and considered a synonym of *S. aureogaster hypopyrrhus* (Ellerman, 1940).

In 1969 I was able to study the type-specimens of *S. aureogaster* and

¹ Archbold Associate Curator, Department of Mammalogy, the American Museum of Natural History.

S. nigrescens in the Muséum National d'Histoire Naturelle, Paris, and in the British Museum (Natural History), London. In the present paper I have identified the type of *S. aureogaster* and have tied the name to a type-specimen. I have identified the holotype of *S. nigrescens* as a representative of the gray squirrels from northern Puebla and have applied the name as a valid subspecies of *S. aureogaster*.

I am grateful to Messrs. John Edwards Hill of the British Museum (Natural History) and F. Petter of the Muséum National d'Histoire Naturelle for allowing me to study the collections under their care, for their many courtesies which helped me complete my studies, and for the loan of specimens. I appreciate the efforts of Mr. Robert E. Logan, staff photographer of the American Museum of Natural History, who took the photographs for the figures, Mrs. Nylene Gilbert, who helped with the bibliographic references and typed the final manuscript, and Miss Lilian Floge and Miss Beatrice Brewster for their translations to English of the French texts discussed herein.

LECTOTYPE OF *SCIURUS AUREOGASTER* F. CUVIER

Sciurus aureogaster was described by Frederic Cuvier in volume three of "Histoire Naturelle des Mamifères, Avec des Figures Originales, Colorées, Dessinées d'Après des Animaux Vivans." The description consists of a text and colored plate. The text is in the sixtieth issue or "Livraison" and is dated September, 1829. The colored plate was published in the fifty-ninth issue. That text and plate were issued separately may explain why many sets in libraries of the United States are incomplete; usually the issue with the plate is available, but rarely the one containing the text. I have seen text and figure together only in the complete set of "Histoire Naturelle des Mamifères" in the library of the Muséum National d'Histoire Naturelle, Paris. Below is a translation of Cuvier's text, in which he described the "Écureuil de la California, ou a ventre doré."

"This new squirrel appears to be native to the western regions of North America, from Mexico to California. Desmarest was kind enough to send me the description he had at Havre of an individual of this species which had been caught between Mexico and Vera Cruz. This squirrel has numerous similarities of color with several species from the eastern regions of the same continent, and principally with the Carolina squirrel; but its head is not as wide as the latter. In this manner it approaches the species of which the European squirrel is the type, that is to say, of those with a narrow head, compared to several American



FIG. 1. A copy of the original illustration of *Sciurus aureogaster* F. Cuvier (1929). The original is in color and was published in volume three of "Histoire Naturelle des Mamifères."

species, a distinction which I indicated in my *Mémoire sur les Ecureuils* (*Mem. du Mus. d'Hist. nat.* t. x., p. 124 et 125), and which seems to have less relation to climate than one would have been led to think, before one knew of the species we are now discussing.

"The squirrel with the golden belly, like the Carolina squirrel, has all its dorsal parts gray, but a little darker, and instead of its flanks being rusty, it has all its ventral parts reddish orange or brilliant gold; but more detail is necessary.

"The gray areas, consisting of hairs whose two extremities are black

and whose middle portions are white, are the head, the end of the ventral jaw, the back, the flanks, the external face of the thighs, the instep and the wrist. A rusty tint can be seen around the ears, on the shoulders and on the neck, with the result that the white part of the hairs has taken on this color. The tail, also gray, consists of black hairs for their ventral half, and white for their other half. Some of these hairs have a rusty base, then a black ring, with white at their tips: but the rust color seems to vary. Of the two specimens in the King's Menagerie, a male and a female, it is the latter which has the most rust in the tail. The throat, chest, the front legs to the fist, the inside face of the thighs, and the hind legs are a brilliant golden rusty color, contrasting with the genital hairs, which, in the male as in the female, are gray. The tail is distichous, and the ears are barely surpassed by a tuft of hair, like those of the common squirrel. The iris is brown and the pupil round.

"This species is bigger than the Carolina squirrel, the length of its body, from the tip of the snout to the base of the tail, is ten inches. The tail is eight.

"I propose to give this squirrel, which has not yet entered the methodological catalogues, the name of *Aureogaster*, due to the color of its ventral parts."

Cuvier's description of *S. aureogaster* is based on notes by Desmarest and on a pair of animals that were living in the King's Menagerie. Cuvier did not indicate whether notes or living animals formed the primary source of his description. It is my impression, however, that the description is based mostly on the two squirrels in the Menagerie. This impression is supported by I. Geoffroy Saint-Hilaire's report of the squirrels collected on the expedition of the "Venus," published in 1855, wherein he discussed Cuvier's description of *S. aureogaster*. On page 156 Saint-Hilaire stated, "Two individuals of this species, of different sexes, but very similar to each other, have lived for some time in the Museum Menagerie, and it is after them that Mr. Frederic Cuvier established the species." Then he quoted part of the text of Cuvier's description and, following that, on page 157 indicated, "It was in 1829 that the menagerie of the Museum had received from California the two individuals described above."

Cuvier did not designate a holotype in his original description, possibly because the animals he described were living in the Menagerie and were not specimens preserved in the museum. There is no question, however, that he described and illustrated a squirrel now known to occur in eastern Mexico, a fact first substantiated by Nelson in his

taxonomic revision of the squirrels of Mexico and Central America published in 1899. Nelson thought that specimens he examined from southern Tamaulipas and northern Veracruz agreed closely with Cuvier's description and figure of *S. aureogaster*. Furthermore, Nelson restricted the type locality to Altamira in southern Tamaulipas. Although I had no opportunity to visit the Muséum National d'Histoire Naturelle in Paris before completing my study of gray squirrels of Latin America, I had access to an incomplete text of Cuvier's description and to his colored plate. Based on these sources, I agreed with Nelson's allocation of the name *aureogaster* to tree squirrels of eastern Mexico and with his estimate of the probable geographic origin of the specimens described by Cuvier (Musser, 1968, p. 95).

The association of the name *aureogaster* with gray squirrels of eastern Mexico seems certain. Still, *aureogaster* is based only on published text and figure and not on a type-specimen. To be able to link *aureogaster* with a type-specimen would add a degree of stability, now absent, to the oldest name available for *Sciurus* of Mexico and Central America. Thus, one of my main purposes in visiting the Muséum National d'Histoire Naturelle in December, 1969 was either to find a specimen which Cuvier had designated as the holotype of *S. aureogaster*, after the text of the original description was published, or to locate specimens of the two squirrels that were living in the Menagerie in 1829.

In Paris I had the pleasure of being guided through the dim and dusty, but historical galleries of mammals in the exhibition halls of the Muséum National d'Histoire Naturelle by Petter, in search of the squirrels described by Cuvier. We located 18 mounted specimens identified as *S. aureogaster* in one of the galleries. These specimens are also listed in the Museum's "Catalogue des Rongeurs" and bear the numbers from 480 to 497. We did not find a specimen which had been designated as the holotype of *S. aureogaster*, but we found the two mounted specimens of squirrels that had been living in the Menagerie in 1829. These are No. 481, an adult male, and No. 482, an adult female. Each is mounted in a lifelike pose on a wooden base. Both are in very good condition and were initially well preserved. Specimen No. 481 bears two cardboard labels, each worded, "Sciurus aureogaster (F. Cuv.), Ménagerie, Mexique." The two labels on No. 482 contain the same information except that the locality is indicated as "Californie." The female died in 1831 and the male in 1833, according to information written on the bottom of the wooden bases. These are the only two specimens from the Menagerie. All the other mounted examples of *S. aureogaster* were acquired in the period 1831 to 1872 from other



FIG. 2. Lectotype of *Sciurus aureogaster* F. Cuvier. The specimen is an adult female and is listed as No. 482 in the Muséum National d'Histoire Naturelle in Paris.

museums or from individuals; thus all were obtained after the text of Cuvier's description had been published in 1829.

Specimens Nos. 481 and 482 are most certainly the two specimens referred to by Cuvier in his original description of *S. aureogaster*, and the two animals mentioned in Saint-Hilaire's report of 1855. Furthermore, Cuvier's colored plate was probably drawn from these squirrels when they were alive in the Menagerie; of the two, the characteristics illustrated in the plate (fig. 1) are more like the female, No. 482 (fig. 2), than the male, No. 481 (fig. 3).



FIG. 3. Paralectotype of *Sciurus aureogaster* F. Cuvier. The specimen is an adult male and is listed as No. 481 in the Muséum National d'Histoire Naturelle in Paris.

The female, No. 482 is typical of the specimens of gray squirrels I have examined from the lowlands of northern and central Veracruz. The chin, throat, and cheeks are whitish gray. Upper parts of the body are grayish white, and the crown is slightly darker. There are no nape and rump patches. Underparts are orange-red. This color extends onto the sides of the body and shoulder regions where it forms a crescent-shaped shoulder and costal patch. The postauricular tufts are whitish gray and inconspicuous. The feet are blackish gray. The underside of the tail is paler than the color of the underparts, orange rather than orange-red. When the animal died in the Menagerie, it was in mostly

fresh pelage. The rump and thighs were still in old and worn pelage, and there are several places on the back where the new pelage had not completely replaced the old. The skull is mounted in the skin.

The male is in fresh pelage the color and pattern of which are similar to that of the female except that the back is slightly darker and the tail partially melanistic; its undersurface is black instead of an orange hue. A broad buffy patch on the rump, absent in the female, breaks up the frosted, steel-gray of the back.

The female, No. 482, should be considered as lectotype of *Sciurus aureogaster* F. Cuvier. It was living in the Menagerie at the time Cuvier described *S. aureogaster* and was probably one of the two specimens upon which his description is based. Furthermore, color and pattern of the pelage of No. 482 also resembles the squirrel depicted in Cuvier's color plate. The male, No. 481, is then paralectotype of *S. aureogaster*.

Nelson's restriction of the type locality of *S. aureogaster* to southern Tamaulipas is valid. Specimen No. 482 could have been obtained from either central or northern Veracruz or southern Tamaulipas. The color of its back is darker than specimens I have examined from southern Tamaulipas and more like squirrels of central Veracruz; there is, however, much individual and geographic variation in tone of the back in samples of *S. aureogaster*, and other features of the pelage of No. 482 correlate with samples from both Tamaulipas and Veracruz. Because the actual geographic origin of No. 482 is unknown, because the type locality has been fixed in the mammalogical literature since 1899, and because no positive evidence supports any change from Nelson's designation, the town of Altamira, in southern Tamaulipas, should be retained as the type locality of *S. aureogaster*.

IDENTITY OF *SCIURUS NIGRESCENS* BENNETT

Sciurus nigrescens was one of seven names proposed by Bennett in a paper read before the Zoological Society of London on March 26, 1833 and subsequently published in the Proceedings of the Society. The specimens discussed by Bennett were "recently obtained by the Society from that part of California which adjoins to Mexico." One specimen formed the basis of the name *S. nigrescens* and Bennett's published description of that individual is short: "The hairs of the upper surface are rather long, soft and smooth; each of them is tipped with white, occasioning, when viewed in certain lights, an iron-gray colour: on the under surface the black is less deep, and the white tips are longer than

on the upper surface. The colour of the limbs corresponds with that of the adjoining surfaces, except on the upper part of the tarsus, where it is black; on the toes, however, the hairs are again freely tipped with white. The long hairs of the tail are nearly all terminated by white, occupying the terminal fourth or fifth part of their length; hence the sides and extremity of that organ are nearly white, the black being most conspicuous along its middle, and for about the first quarter of its length.

"The pale spot behind each ear, if permanent in the species, will furnish a ready distinguishing mark."

From 1833 to 1877, *S. nigrescens* was treated in the mammalogical literature as a species of tree squirrel known only from California. Five years after Bennett's description of *S. nigrescens* was published, the holotype was studied by the Reverend Dr. John Bachman, in connection with his monograph of the squirrels of North America. Bachman presented the results of his study and exhibited specimens of most of the species he recognized before the meeting of the Zoological Society of London on August 14, 1838. His report was published in the Proceedings of the Society in 1838 and contained a reference to *S. nigrescens*, but not a description of the holotype. The following year Bachman's complete "Monograph of the Genus *Sciurus*, with Descriptions of New Species and their Varieties, as existing in North America," was published in installments in Edward Charlsworth's *The Magazine of Natural History*. During the same year an abridgment of this report was published in *The American Journal of Science and Arts* as an "Abstract of a Monograph of the Genus *Sciurus* with descriptions of several new species and varieties." In both papers Bachman redescribed the holotype of *S. nigrescens*, providing a more detailed and precise description than had Bennett.

Following Bachman's reports, *S. nigrescens* was listed by Wagner in Schreber (1843). Wagner apparently did not examine the holotype, and his description of *S. nigrescens* is a quotation of Bachman's (1839a, p. 334) description published in *The Magazine of Natural History*.

In 1845 Heinrich Schinz listed *S. nigrescens* in his "Synopsis Mammalium" (p. 19), along with a short description taken from Bennett's original. Schinz did not associate the name with any other species.

The most complete account of *S. nigrescens* up to this time appeared in volume three of the "Quadrupeds of North America" (pages 74-76), by John James Audubon and Rev. Bachman. It consisted of a description of the animal, which was similar to Bachman's description pub-

lished in 1839, and a colored figure (pl. cxvii) drawn by Audubon from the holotype. *Sciurus nigrescens* was still based only on the holotype and thought to occur in California.

In 1857, following the account of Audubon and Bachman, *S. nigrescens* was listed by Spencer Fullerton Baird in his report on the mammals collected or observed along various routes which had been surveyed for a railroad line from the Mississippi River to the Pacific Ocean (p. 280). Baird apparently did not examine the holotype of *S. nigrescens*. He gave a terse description of it and indicated that the species was from "Lower California."

Subsequently, J. E. Gray did examine the holotype of *S. nigrescens* and discussed it under the name "*Macroxus nigrescens*" in a "Synopsis of the Species of American Squirrels in the Collection of the British Museum" published in 1867 (p. 424). Gray's description of the holotype is an abridgment of Bennett's original, but he had these comments on its status: "This specimen is in a bad state. It may be only a small variety of *M. vulpinus*, or a bad state of *M. variegatoides*, or distinct. The ears are in a bad state; but they appear as if they might have been more hairy than those of the usual *Macroxi*." In the same year L. J. Fitzinger (1867, p. 479) listed *S. nigrescens* as a valid species in his "Versuch einer natürlichen Anordnung der Nagethiere (Rodentia)."

From 1877 to 1940 most persons writing on taxonomy of North American squirrels regarded *S. nigrescens* as a synonym of *Sciurus hypopyrrhus*, a taxon named and described by Wagler in 1831. Allen was the first worker to list *nigrescens* as a synonym of *hypopyrrhus*. In the "Monographs of North American Rodentia" published in 1877, he explained his reasons for doing so (pp. 748-749): "I am quite confident that the *Sciurus nigrescens* of Bennett, described in 1833 . . . is referable to the dark phase of the present species *S. hypopyrrhus*. The great length of the tail as compared with the body renders it almost certain that it can refer to no other known species, the tail being about three inches longer than the body—a proportion found in no other Mexican Squirrel. The general size, as well as the narrowness of the tail, gives further evidence of its correct reference being here. There are, furthermore, two specimens in the collection that agree with Bennett's description, which I have no hesitation in referring to this species." Allen did not examine the holotype of *S. nigrescens* and his conclusions are based partly on Bennett's original description and partly on Bachman's later redescription of Bennett's specimen.

The following year, in his report "On the Squirrels of the Neotropical Region" (pp. 128-230), Edward R. Alston agreed with Allen

and listed *S. nigrescens* as a synonym of *S. hypopyrrhus*. Furthermore, Alston divided *S. hypopyrrhus* into five phases: the *hypopyrrhus* type, the *rigidus* type, the *dorsalis* type, the *colliae* type, and the *melania* type. He referred Bennett's *nigrescens* to the "*hypopyrrhus* type." Alston had examined all the holotypes of the names which he listed as synonyms of *S. hypopyrrhus*, except the actual holotype of *hypopyrrhus*. His knowledge of that form was based on the descriptions by Wagler (1831) and Wagner (1843). In comparing Bennett's specimen with these descriptions of *S. hypopyrrhus*, Alston noted "That of *S. nigrescens* only differs in having the fur of the lower parts ringed like that of the back; it agrees well with specimens in the Paris and Berlin Museums." Alston's treatment of *S. nigrescens* and *S. hypopyrrhus* in his monograph on "Mammalia" in the "Biologia Centrali-Americana" published during the period, 1879–1882, duplicates his account published in 1878.

Alston's report of 1878 was followed by Allen's "Synonymatic List of the American Sciuri, or Arboreal squirrels" published later in the same year. There Allen again listed *S. nigrescens* as a synonym of *S. hypopyrrhus* and implied the name was based on a melanistic phase (p. 881).

Trouessart also listed *S. nigrescens* as a synonym of *S. hypopyrrhus*, both in his "Catalogue des Mammifères Vivants et Fossiles," published in 1881 (p. 81), and in the issue of the "Catalogus Mammalium tam viventium quam fossilium" published in 1897 (p. 426).

Nelson's taxonomic revision of squirrels of Mexico and Central America, published in 1899, was the most comprehensive and competent study of tree squirrels of Latin America up to that time. Nelson's study was based primarily on specimens obtained by himself and E. A. Goldman during their biological surveys of Mexico and Guatemala for the United States Department of Agriculture, Bureau of Biological Survey. In an attempt to identify the many scientific names that had been applied to squirrels of Mexico and Central America, Nelson selected various examples from his large collection, sent them to Oldfield Thomas at the British Museum (Natural History), and asked Thomas to compare them with pertinent holotypes. With Thomas's cooperation Nelson was able to identify several names, but he does not indicate in his published report that any of the specimens were compared with the holotype of *S. nigrescens*, nor does he discuss or list that taxon, even under Wagler's name, *hypopyrrhus*, which Nelson, with good reason, treated as a subspecies of *Sciurus aureogaster*.

Of the major reports published subsequent to Nelson's that deal entirely or partly with taxonomy and distribution of Latin American

squirrels (Miller and Rehn, 1901; Elliot, 1904, 1905, and 1907; Harris, 1937; Ellerman, 1940; Kelson, 1952; Miller and Kellogg, 1955; Hall and Kelson, 1959; Leopold, 1959; Alvarez, 1961; Anderson, 1962; and Musser, 1968) Bennett's name *nigrescens* was listed only by Ellerman (1940, p. 334) who examined the holotype and listed the name as a synonym of *Sciurus aureogaster hypopyrrhus*.

Despite the published descriptions and figure of the holotype of *S. nigrescens*, and the opinions of various workers about the status of this name, its identity was still vague when my paper on gray squirrels of Mexico and Guatemala was published in 1968. After consulting the reports discussed on the previous pages and examining Audubon's colored figure, I could not clearly associate the name *S. nigrescens* with any sample of *Sciurus* from the United States, Mexico, or Central America. I did not share Allen's certainty that *nigrescens* was a synonym of *S. hypopyrrhus*, nor could I refer any of the specimens in the collections of the American Museum of Natural History, some of them the same ones examined by Allen in his report of 1877, to *S. nigrescens*. The holotype of *S. nigrescens* needed to be studied directly before its identity could be clarified.

Through the courtesy of John Edwards Hill, I had the opportunity to study the holotype of *S. nigrescens* during a visit to the British Museum (Natural History) in September of 1969. *Sciurus nigrescens* is not a synonym of Wagler's name *S. hypopyrrhus*, as listed by Allen, Alston, and Ellerman. Instead it applies to samples of *S. aureogaster* from mountains along the southeastern edge of the Mexican Plateau. Furthermore, it is the oldest name for the samples included in my "Socialis Group" of *S. aureogaster* (Musser, 1968).

The holotype of *S. nigrescens*, B.M. No. 53.8.29.35, consists of a cranium, mandibles, and a stuffed skin. The cranium is complete except that some parts of the occipital region are missing. The skin is conspicuously overstuffed but is otherwise in very good condition, an unexpected surprise considering the specimen was collected more than 130 years ago. The animal is an adult male. The suture between the basisphenoid and basioccipital is fused and the cusps of all the cheek teeth are considerably worn. The label attached to the skin designates the geographic origin as simply, "Locality California."

The holotype of *S. nigrescens* was not collected in California. The specimen was most likely obtained from the southeastern edge of the Mexican Plateau in the high mountains of northern Puebla. This statement is based on my taxonomic study of *Sciurus aureogaster* (Musser, 1968), for which more than 2000 specimens from Mexico and Guate-

mala were examined. To analyze individual and geographic variation, most of those specimens were sorted into 65 groups of samples. The holotype of *S. nigrescens* matches the series of eight specimens which formed sample 51. All eight squirrels were collected by myself and James H. Brown in forests of oak and conifer near Mesa de la Tuca and Cruz Alta, local landmarks southeast of the town of Aquixtla, at altitudes between 9000 and 10,000 feet in the mountains of northern Puebla. The specimens are in the collection of the University of Michigan, Museum of Zoology. Bennett's specimen is like those in sample 51 in size, color and pattern of pelage, and has similar long (the hairs reach 20–25 mm. along the back), dense, and soft pelage. The length and texture of its pelage is typical of tree squirrels living at elevations above approximately 9000 feet. External and cranial dimensions and score values, which indicate color and pattern of pelage, are listed in table 1 for the holotype of *S. nigrescens* and seven of the eight specimens in sample 51.

The over-all appearance of the holotype of *S. nigrescens* is that of a dark, bluish black tree squirrel with long pelage and a bushy tail. The crown, back, and sides of the body are frosted, steel-blue. The postauricular tufts are small and dirty white, but still conspicuous. The nape and rump patches are broad and buffy; they do not contrast sharply with the steel-blue color of the back and sides of the body. The underparts are a frosted, grayish black. The feet are blackish and lightly frosted. The tail is partially melanistic; the long hairs are black for most of their lengths and tipped with smoky white. These tips are probably discolored because Bennett described them as white. Thus the upper surface of the tail appears bluish black frosted with white; the undersurface is dark, grayish buff. The tail is conspicuously longer than the head and body, but it was obviously stretched in the initial preparation of the skin. It was primarily this feature, the long tail relative to length of head and body, reported by Bennett, which led Allen to include *S. nigrescens* in the synonymy of *S. hypopyrrhus*.

Most features of the skull of the holotype are like those in sample 51. It differs only in being slightly larger than any member of that series (table 1).

Judged mainly by features of its pelage, the specimen described by Bennett came from the same population as the specimens in sample 51, obtained from northern Puebla. Of all the specimens I have examined in collections of museums, the holotype of *S. nigrescens* matches only those specimens in sample 51. Furthermore, Bennett's specimen differs from known samples of gray squirrels obtained from highlands to the

TABLE 1
 DIMENSIONS AND FEATURES OF PELAGE OF *Sciurus aureogaster* FROM NORTHERN PUEBLA
 (SAMPLE 51) COMPARED WITH HOLOTYPE OF *S. nigrescens*.
 (Measurements are in millimeters)

	Sample 51 (U.M.M.Z. Nos.)																					
	+♂	113970		+♂	113972		♂	112581		♂	113971		♂	112580		♂	113969		+♂	113973		B.M. No.
External and Cranial^a																					53.8.29.35	
Length of head and body	260	275	290	285	275	270	280	260														
Length of tail	255	270	255	255	240	230	255	280														
Length of hind foot	67	68	68	73	66	70	70	70														
Greatest length of skull	60.6	58.0	61.0	62.2	59.8	58.5	—	—														
Zygomatic breadth	34.1	34.7	34.7	34.6	34.0	32.7															35.5	
Interorbital breadth	17.2	18.1	19.6	19.1	19.1	18.0															19.2	
Alveolar length of PM ⁴ -M ³	11.9	11.6	11.5	11.7	11.1	11.3															11.2	
Diameter of sphenopalatine vacuities	2.0	0.8	3.2	1.9	1.9	3.5															2.6	
Color and Pattern of Pelage (score values)^b																						
Crown	0	0	0	0	0	0	0	0													0	
Postauricular patches	1	1	1	1	1	1	1	1													1	
Color of eye ring	1	1	1	1	1	1	1	1													1	
Extent of nape and rump patches	2	2	2	2	2	2	2	2													2	
Color of nape and rump patches	1	1	1	1	1	1	1	1													1	
Color of underparts	-0	-0	-0	-0	-0	-0	-0	-0													-0	
Color of feet	3	2	3	3	2	2	2	3													3	
Color of ventral surface of tail	0	0	0	0	0	0	0	0													0	

^a External measurements of U.M.M.Z. specimens are those taken by the collectors; I took measurements of B.M.N.H. No. 53.8.29.35 from the dry, stuffed skin.

^b See Musser (1968, pp. 12-18) for definitions of the gradations in features of pelage indexed by these scores.

west in the states of Mexico, Morelos, and Central Puebla (sample 50) and from samples obtained in highlands to the north in Puebla and Hidalgo (sample 52), and east in Veracruz (samples 53, 54, and 55) in the same features and to the same degree that the specimens in sample 51 differ from those groups of samples (Musser, 1968, pp. 52-53). For these reasons, the type locality of *S. nigrescens* can be restricted to the high mountains south and southeast of the town of Aquixtla, in northern

Puebla. The evidence available to me supports restriction of the type locality to this general area, but not to a more precise locality.

In my study of *Sciurus aureogaster* I recognized two main groups of populations within the species. One was called the "Aureogaster Group," the other the "Socialis Group." It was on the morphological, ecological, and geographical characteristics of these two groups that I divided the species into two subspecies and recognized the "Aureogaster Group" as *Sciurus a. aureogaster* and the "Socialis Group" as *S. a. socialis*. The specimens in sample 51 from northern Puebla fit within the "Socialis Group." It is that sample to which the name *S. nigrescens* applies. Bennett's name was published four years before Wagner's name *S. socialis*, published in 1837; therefore my former "Socialis Group" becomes the Nigrescens Group, and that segment of *S. aureogaster* can be taxonomically recognized as *S. a. nigrescens*.

In this arrangement the name *socialis* becomes a junior synonym of the name *nigrescens*. The latter is then a senior synonym and it is one that has never been used in the primary mammalogical literature since 1877, but one that was always listed as a synonym of *S. hypopyrrhus* Wagler (1831) during the years from 1877 to the present (Allen, 1877 and 1878; Alston, 1878; Trouessart, 1881 and 1897; and Ellerman, 1940). On the other hand, the name *socialis* has been used for more than 50 years. From 1837 to 1878 *S. socialis* was always listed in the literature as a distinct species (Schinz, 1845; Baird, 1857; Gray, 1867; Fitzinger, 1867; and Allen, 1877). Alston in 1878 (p. 660) was the first person to place the name in synonymy and included it under *S. variegatus*. Later that same year, Allen (1878, p. 882) listed *S. socialis* as a synonym of *S. aureogaster*, and Trouessart followed this arrangement in 1881 (p. 79). Three years later, however, Jentink (1883, p. 97) listed the name as a synonym of *S. variegatus*. In 1899 Nelson recognized *S. socialis* as a good species and until 1968 his study was accepted by authors writing on taxonomy and distribution of squirrels of Latin America (for example, see Miller and Rehn, 1901; Elliot, 1904, 1905, and 1907; Trouessart, 1897-1905 [1904]; Ellerman, 1940; Miller and Kellogg, 1955; Leopold, 1959; Hall and Kelson, 1959; and Alvarez, 1961). Then in 1968 *S. socialis* was treated as a valid subspecies of *S. aureogaster* (Musser, 1968).

To use Bennett's name *nigrescens* seems to be in conflict with Article 23b of the International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology (Stoll, and others, 1961). That article has been widely criticized by taxonomists and is currently under review by the International Commission on Zoological Nomenclature (Mayr, 1969, pp. 350-352). Nevertheless, *S. nigrescens* is a name

that should be used; it should not be relegated to the status of a *nomen oblitum*. The name is based on a well-preserved specimen. The geographic origin of that specimen can be determined and the type locality can be fixed with confidence. Furthermore, the name can be used at four different levels, each level corresponding to one of the four important alternatives of taxonomically treating populations of *S. aureogaster* (Musser, 1968, pp. 94–95).

Two of the alternatives are extremes. At one extreme *S. aureogaster* would be treated as a monotypic species and no subspecies would be recognized. Then the name *nigrescens* would become simply a synonym of *S. aureogaster*. At the other extreme 20 or more subspecies of *S. aureogaster* would be listed. In this arrangement the name *nigrescens* would be used only for the squirrels of northern Puebla (sample 51), one of at least three populations that I indicated would have to be named if this taxonomic arrangement were employed (Musser, 1968, p. 94). In this case the availability of the name *nigrescens* would prevent the addition of a new name to a group already burdened with synonyms.

The other two alternatives are reasonable. In one arrangement four subspecies of *S. aureogaster* would be recognized. The squirrels of eastern Mexico would be listed as *S. a. aureogaster*; populations of the Mexican Plateau (including the Sierra de Coalcomán, Michoacán) and central Mexico (including the Sierra de Miahuatlán, Oaxaca, and the mountains near Santa María Ozolotepec, Oaxaca) would be brought together under *S. a. nigrescens*; squirrels of the Pacific Coast would be called *S. a. socialis*; and populations of eastern Chiapas and Guatemala would be known as *S. a. griseoflavus*. In this arrangement the name *nigrescens* would replace *S. a. poliopus*, and the name *socialis* would not be a synonym of *nigrescens*, but would be valid for one large group within *S. aureogaster*. The other reasonable alternative would be to recognize two subspecies, *S. a. aureogaster* and *S. a. nigrescens*, each corresponding to the two major groups of populations within the species. This taxonomic arrangement represents the level of usage discussed previously in the present paper, is one that seems the most objective taxonomic interpretation of available data, and is the one I still prefer to use.

LITERATURE CITED

ALLEN, J. A.

1877. Sciuridae. Monographs of North American Rodentia, no. 11, pp. 631–939. In: Report of the United States geological survey of the territories, vol. 9, pp. i–xii, 1–x, 1–1091, 7 pls.

1878. Synonymatic list of the American Sciuri, or arboreal squirrels. Bull. U. S. Geol. Geogr. Surv., vol. 4, no. 4, pp. 877-887.
- ALSTON, E. R.**
1878. On the squirrels of the Neotropical Region. Proc. Zool. Soc. London, vol. 2, pp. 656-670, 1 pl.
- 1879-1882. Biologia Centrali-Americanana. Mammalia, xx + 220 pp., 22 pls.
- ALVAREZ, T.**
1961. Sinopsis de las ardillas arbóreas del género *Sciurus* en México (Mamm. Sciuridae). Ann. Esc. Nac. Cienc. Biol., México, vol. 10, pp. 123-148, figs. 1-3.
- ANDERSON, S.**
1962. Tree squirrels (*Sciurus colliae* Group) of western Mexico. Amer. Mus. Novitates, no. 2093, pp. 1-13.
- AUDUBON, J. J., AND J. BACHMAN**
1854. Quadrupeds of North America. Vol. 3. New York, V. G. Audubon, v + 348 pp.
- BACHMAN, J.**
1838. Monograph of the species of squirrel inhabiting North America. Proc. Zool. Soc. London, pt. 6, pp. 85-103.
- 1839a. Monograph of the genus *Sciurus*, with descriptions of new species and their varieties, as existing in North America. Mag. Nat. Hist., London, new ser., vol. 3, pp. 113-123, *et seq.*
- 1839b. Abstract of a monograph of the genus *Sciurus*, with descriptions of several new species and varieties. Amer. Jour. Sci. Arts, vol. 37, pp. 290-310.
- BAIRD, S. F.**
1857. Mammals. Reports of explorations and surveys, to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean. vol. 8, pt. 1, xxv-xlvii + 757 pp., pls. 17-60. (Ex. Doc. no. 78, 33d Congress, 2d Session.)
- BENNETT, E. T.**
1833. Characters of new species of *Mammalia* from California. Proc. Zool. Soc. London, pt. 1, pp. 39-42.
- CUVIER, F.**
1829. Histoire Naturelle des Mammifères, avec des figures originales, coloriées, dessinées d'après des animaux vivans. Publiée sous l'autorité de l'Administration du Muséum d'Histoire Naturelle. (with I. Geoffroy Saint-Hilaire). Tome 3 (the plate is in the fifty-ninth issue, the text in the sixtieth issue). Paris, Chez A. Belin.
- ELLERMAN, J. R.**
1940. The families and genera of living rodents. London, British Museum (Natural History), vol. 1: Rodents other than Muridae, xxvi + 689 pp.
- ELLIOT, D. G.**
1904. The land and sea mammals of Middle America and the West Indies. Field Columbian Mus. Publ., zool. ser., vol. 4, pt. 1, xxi + 439 pp., + xl ix, 130 figs.
1905. A check list of mammals of the North American continent, the West Indies, and the neighboring seas. *Ibid.*, Publ. no. 105, vol. 6, iv + 761 pp., 1 fig.

1907. A catalogue of the collection of mammals in the Field Columbian Museum. *Ibid.*, Publ. no. 115, vol. 8, vii + 694 pp., 92 figs.
- FITZINGER, L. J.
1867. Versuch einer natürlichen Anordnung der Nagethiere (Rodentia). Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Math. Naturwiss. Classe, band lv, abth. i, pp. 401-534.
- GRAY, J. E.
1867. Synopsis of the species of American squirrels in the collection of the British Museum. Ann. Mag. Nat. Hist., vol. 20, ser. 3, pp. 415-434.
- HALL, E. R., AND K. R. KELSON
1959. The mammals of North America, vol. 1. New York, Ronald Press, xx + 312 pp., figs. 1-79.
- HARRIS, W. P., JR.
1937. Revision of *Sciurus variegatoides*, a species of Central American squirrel. Misc. Publ. Mus. Zool., Univ. Michigan, vol. 38, pp. 1-39, figs. 1-3, pls. 1-3, 1 map.
- JENTINK, F. A.
1883. List of the specimens of squirrels in the Leyden Museum. Notes Leyden Mus., vol. 5, pp. 91-144.
- KELSON, K. R.
1952. The subspecies of the Mexican red-bellied squirrel, *Sciurus aureogaster*. Univ. Kansas Publ. Mus. Nat. Hist., vol. 5, no. 17, pp. 243-250, 1 fig.
- LEOPOLD, A. S.
1959. Wildlife of Mexico. The game birds and mammals. Berkeley and Los Angeles, Univ. California Press, xiii + 568 pp.
- MAYR, E.
1969. Principles of Systematic Zoology. New York, McGraw-Hill Book Co., xiv + 428 pp.
- MILLER, G. S., JR., AND R. KELLOGG
1955. List of North American Recent mammals. Bull. U. S. Natl. Mus., no. 205, xii + 954 pp.
- MILLER, G. S., JR., AND J. A. G. REHN
1901. Systematic results of the study of North American land mammals to the close of the year 1900. Proc. Boston Soc. Nat. Hist., vol. 30, no. 1, pp. 1-352.
- MUSSER, GUY G.
1968. A systematic study of the Mexican and Guatemalan gray squirrel, *Sciurus aureogaster* F. Cuvier (Rodentia: Sciuridae). Misc. Publ. Mus. Zool., Univ. Michigan, no. 137, pp. 1-112.
- NELSON, E. W.
1899. Revision of the squirrels of Mexico and Central America. Proc. Washington Acad. Sci., vol. 1, pp. 15-106, 1 pl.
- SAINT-HILAIRE, I. GEOFFROY
1855. Mammifères. In Baudry, Gide and J., *Voyage autour du monde sur la fregate La Venus commandée par Abel Du Petit-Thouars*. Paris, Tome 5, pt. 1, Zoologie, pp. 1-351.
- SCHINZ, H.
1845. Synopsis Mammalium. Sohn, in Solothurn, J. Gassman, iv + 574 pp.

STOLL, N. R., AND OTHERS (EDS.)

1961. International code of zoological nomenclature adopted by the XV International Congress of Zoology. London, Richard Clay and Co., Ltd., xvii + 176 pp.

TROUESSART, E. L.

1881. Catalogue des mammifères vivants et fossiles. Orde des Rongeurs. Bull. Soc. Études Sci. Angers, 10th ann., pt. 1, pp. 58-212.
- 1897-1905. Catalogue mammalium tam viventium quam fossilium. Nova edito (prima completa). Berlin, R. Friedlander und Sohn, pt. 1 (1897), pp. 1-218; pt. 2 (1897), pp. 219-452; pt. 3 (1897), pp. 453-664; pt. 4, (1898), pp. 665-998; pt. 5 (1898), pp. 999-1264; pt. 6 (1899), pp. 1265-1469; supplement, pts. 1-2 (1904), pp. 1-546; pts. 3-4 (1905), pp. 547-929.

WAGLER

1831. Einige Mittheilungen über Thiere Mexicos. Isis von Oken, pp. 510-535.

WAGNER, J. A.

1837. Beiträge zur Kenntnis der warmblutigen Wirbelthiere Amerika's. (Abhandl. der Math.-Phys. Classe der Königlich Bayerischen Akad. Wiss. München, band 2, pp. 1-94 [repaged], pls. 1-5).
1843. Die Beutelthiere und Nager. In Schreber, Johann Christian Daniel von, Die Säugethiere in Abbildungen nach den Natur, mit Beschreibungen. Supplement band, pts. 3, 4, xiv + 523 pp.

